REMARKS/ARGUMENTS

This is a Response to the Office Action mailed September 10, 2003, in which a three (3) month Shortened Statutory Period for Response has been set, due to expire December 10, 2003. Twenty (20) claims, including five (5) independent claims, were paid for in the application. Claims 10-20 have been canceled. Claims 1-4 and 6 have been amended. No new matter has been added to the application. No fee for additional claims is due by way of this Amendment. The Commissioner is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090. Claims 1-9 are pending.

Election/Restrictions

In response to the Restriction Requirement mailed June 18, 2003, Applicants elected with traverse to prosecute the claims of Group I, and particularly claims 1-7 and 9. In view of the above election, and because the requirement was made final, Applicants hereby cancel claims 10-20 without prejudice to the filing of any divisional, continuation, or continuation-in-part application.

Objections

The declaration was objected to because it does not state that the person making the oath or declaration believes the named inventor or inventors to be the ***sole or joint*** inventor or inventors of the subject matter which is claimed and for which a patent is sought. Applicants respectfully note that 37 CFR 1.63(a)(4) no longer requires that the oath or declaration state whether the inventor is a sole or joint inventor of the invention claimed. 37 CFR 1.63(a)(4), as revised on September 8, 2000, requires instead that an oath or declaration state that the person making the oath or declaration believes the named inventor or inventors to be the original and first inventor or inventors of the subject matter which is claimed and for which a patent is sought. Because Applicants' declaration, the form for which was obtained from the U.S. Patent and Trademark Office website, complies with the current requirements of 37 CFR 1.63, Applicants respectfully request that the objection to the declaration be withdrawn.

The drawings were objected to because reference character "42" has been used to designate both the second resistor and the n-channel junction field effect transistor, and because the drawings do not include the reference character "44" mentioned in the description. Figure 2 has been amended to include the reference character "44" to designate the n-channel junction field effect transistor as mentioned in the description, thus resolving both of the Examiner's objections to the drawings.

35 U.S.C. §102(b) Rejections

Claims 1-7 and 9 were rejected under 35 U.S.C. §102(b) as being anticipated by Keller et al. (U.S. Patent No. 3,850,695).

The disclosed embodiment of the invention will now be discussed in comparison to the applied reference. Of course, the discussion of the disclosed embodiment, and the discussion of the differences between the disclosed embodiment and the subject matter described in the applied reference, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner to appreciate important claim distinctions discussed thereafter.

The exemplary embodiments of Applicants' invention are directed to fuel cell systems for powering a work load, including a fuel cell stack and a shunt regulator having a threshold detection; a transistorized power switching element, and a dump load. The threshold detection element identifies when an abnormally high voltage rises. The power switching element routes power from the high voltage bus to the dump load. The dump load acts as an electrical energy sink, and may provide dissipated energy to the fuel cell stack in the form of heat. The switching element can also shunt power to the dump load when a digital control signal is set, for example at startup or during cold start conditions.

U.S. 3,850,695 issued to Keller et al. (hereinafter Keller) is generally directed to a voltage regulator system for use with a fuel cell stack. In particular, Keller is directed to the intermittent operation of a pump feeding fuel to the fuel cell based on power consumed by the work load and/or to maintain a sufficiently high voltage on the output bus. Keller, Abstract. Keller further teaches adjusting the frequency and/or duration of the pumping cycle to

compensate for the drop in concentration of fuel resulting from re-circulation of partly spent fuel. Keller, Abstract; col. 3, line 28-col. 4, line 25; and col. 4, line 44-col. 5, line 3.

Keller shows the fuel cell stack 2 supplying power to a load 3, as well as to a motor 7 that is coupled to drive a pump 8 that supplies fuel to the fuel cell stack 2. Keller, Figure. A monitoring circuit means 4 monitors the current drawn by the load 3, adjustably supplying power to the motor 7 via control circuit means 5 including a transistor 64 to cause the pump 8 to supply fuel to the fuel cell stack 2 in proportion to the current draw. Keller, col. 2, lines 3-15, and Figure.

While supplying fuel based on current draw (*i.e.*, current regulation) will typically reduce the likelihood of the voltage on the output bus falling below a defined threshold, Keller teaches two stages of voltage regulation for those instances where the current regulation is not sufficient to also maintain the voltage. Keller, col. 2, line 60-col. 4, line 25.

Both stages employ the monitoring circuit means 4 to monitor the voltage across the output bus via a measuring resistor 31. In the first stage of voltage regulation, if the voltage falls below the defined value, a first voltage sensitive switch 22 supplies a signal to a monostable flip-flop 12 to drive the motor/pump 7, 8 via a regulating switch 24 for a defined period. Keller, col.2, line 60-col. 3, line 5; and col. 7, line 66-col.8, line 8. Importantly, when the voltage across the output bus *falls* below a defined threshold, the control circuit 5 will *increase* the duration and/or frequency of the motor/pump cycle in order to *compensate* by providing *more* fuel to the fuel cell stack. In the second stage of voltage regulation, should the output voltage fall below a defined threshold, a second voltage sensitive switch 23 causes switch 16 to shed the load 3 until the operator opens and recloses a main switch 13. Keller, col. 3, lines 11-27; col. 8, lines 9-22,and Figure.

Turning to the specific claim language, claim 1 recites, *inter alia*, "a first transistor coupled for activation via the first threshold detector; and a first dump load, wherein the first transistor is responsive to the stack terminal voltage across the first set of fuel cells to selectively couple the first dump load in parallel with the first set of fuel cells when the stack terminal voltage across the first set of solid polymer electrochemical fuel cells *exceeds a threshold voltage* and to uncouple the first dump load when the stack terminal voltage across the

first set of solid polymer electrochemical fuel cells is below the threshold voltage." (Emphasis added.)

The Examiner contends that the electric motor of Keller constitutes a dump load, and thus Keller anticipates claim 1. However, in its first stage voltage regulation scheme, Keller teaches *increasing* the power to the motor 7 (via increased duration and/or frequency of driving pulses) in response to the output voltage *falling* below a defined threshold. Keller, col.2, line 60–col. 3, line 5, and col. 7, line 66-col.8, line 8. Thus, Keller teaches *coupling* the motor 7 to the fuel cell stack 2 *when the output voltage falls below the threshold value* and ipso facto *uncoupling* the motor from the power source *when the output voltage exceeds the threshold value.*. Consequently, the Keller teaching is in *direct contrast* to Applicants' claim 1.

Further, the motor 7 would *not* function as a *dump load* to dampen an overvoltage condition. Keller teaches *increasing* the power to the motor 7 (via increased duration and/or frequency) in response to the *voltage falling* below a defined threshold (first stage voltage regulation). Keller, col.2, line 60 –col. 3, line 5, and col. 7, line 66-col.8, line 8. Thus, "the control pulse results in providing *additional supply of fuel* to the fuel cell battery 2" Keller, col.8, lines 4-8 (emphasis added). Consequently, the fuel cell 2 will produce *more* power, *resulting in a higher voltage* on the output bus, and further upward adjustments to the purported "dump load" (*i.e.*, motor 7). This operation results in the catastrophic runaway of the system.

Even further, Applicants' description, which defines the terms in the claims, draws a distinct dichotomy between work loads and dump loads. In particular, the work load includes the device to be powered by the fuel cell system such as a vehicle, appliance, computer and/or associated peripherals as well as portions of the fuel cell system such as the control electronics. Specification, page 5, line 23-page 6, line3. In contrast, the dump load includes a resistive element such as a resistor for thermally *dissipating excess power* when shunted across the high voltage bus, and may also include capacitive and/or inductive elements. Specification, page 7, lines 16-24. Thus, as defined by the Applicants' specification, the electric motor 7 that drives the pump 8 in the Keller reference constitutes a work load rather than a dump load. In this respect, Applicants note the long standing case law that recognizes an applicant's right to act as their own lexicographer.

Claim 2 recites, *inter alia*, "a second threshold detector," "a second transistor," and "a second dump load." Keller fails to disclose or suggest a second threshold detector, a second transistor, or second dump load. Even if the motor taught by Keller constituted a first dump load and even if Keller taught multiple sets of fuel cells, there is no suggestion in the art to use separate dump loads for each set of fuel cells. In fact, Keller would actually teach a single "dump load" since only a single motor is disclosed. In this respect, Applicants reiterate that the motor does not constitute a dump load, for the reasons stated above.

As amended, claim 3 recites, *inter alia*, "wherein the dump load is positioned upstream from the solid polymer electrochemical fuel cells in an air flow for providing heat to the solid polymer electrochemical fuel cells." Keller does not teach or suggest a relative position of the motor with respect to the fuel cell stack in terms of an airflow, nor does Keller suggest using heat from the motor to warm the fuel cell stack.

Claim 4 recites, *inter alia*, "wherein the dump load is positioned proximate the solid polymer electrochemical fuel cells for providing heat thereto." Keller does not suggest a relative position of the motor with respect to the fuel cell stack, nor does Keller suggest using heat from the motor to warm the fuel cell stack.

Claim 5 recites, *inter alia*, "a capacitance electrically coupled across the dump load." While Keller teaches the use of capacitors, Keller fails to teach the coupling of a capacitor *across the dump load.*

Claim 6 recites, *inter alia*, "an inductance electrically coupled in series between the first set of solid polymer electrochemical fuel cells and the dump load." While Keller teaches the use of an inductor, Keller fails to teach the coupling of an inductor *in series between the first set of solid polymer electrochemical fuel cells and the dump load.* In particular, Keller teaches coupling the inductor 48 in series between the fuel cell stack 2 and the work load 3.

Claim 7 recites, *inter alia*, "wherein the first transistor is an n-channel field effect transistor." While Keller teaches the use of npn transistors, such transistors are bipolar transistors, not field effect transistors. Keller, Figure.

Claim 9 is dependent from claim 1 and allowable over Keller for the same reasons as set forth above with respect to claim 1.

Conclusion

Overall, the cited reference does not teach or suggest the claimed features of the embodiments recited in independent claim 1, and thus such claim is allowable. Because the remaining claims depend from allowable independent claim 1, and also because they include additional limitations, such claims are likewise allowable. If the undersigned attorney has overlooked a relevant teaching in any of the references, the Examiner is requested to point out specifically where such teaching may be found.

In light of the above amendments and remarks, Applicants respectfully submit that all pending claims are allowable. Applicants, therefore, respectfully request that the Examiner reconsider this application and timely allow all pending claims. Examiner Alejandro is encouraged to contact Mr. Abramonte by telephone to discuss the above and any other distinctions between the claims and the applied references, if desired. If the Examiner notes any informalities in the claims, he is encouraged to contact Mr. Abramonte by telephone to expediently correct such informalities.

Respectfully submitted,

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FA:lrj

Enclosure:
Postcard
1 Sheet of Formal Drawings (Fig. 2)

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